14. A method for the production of a compound as defined in claim 1, which method comprises polymerizing a bis(halomethyl) substituted phenyl monomer in the presence of a base to form a poly(arylene vinylene), wherein the phenyl monomer has adjacent substituents on the phenyl residue.

C2

31. An electric, electronic, optical or optoelectronic component or device having a coating of a soluble, film-forming conjugated poly(1,4-arylene vinylene) compound comprising a 1,4-phenylene vinylene unit having adjacent substitutents which produces blue-shifted electroluminescence or photoluminescence.

C3

REMARKS

Pursuant to this amendment, the pending claims are 1-7, 9 and 11-31. A copy of all pending claims is attached for the convenience of the examiner.

103 Rejection

Claims 1-24 and 30-31 were rejected under Section 103(a) as obvious over EP 0745658, or Wei et al., or Antoniadis et al., or Wan et al., or Hsieh et al.

Independent claim 1, and claim 14 which depends from claim 1, have been amended to define more clearly the present invention. Specifically, amended claim 1 states that the poly(1,4-arylene vinylene) compound is a poly(1,4-phenylene vinylene). Further, claim 1 has been amended to state that it is the 1,4 phenylene vinylene unit which has adjacent substituents. Support for these amendments can be found, for example, on page 3, lines 3-4 of the second full paragraph.

Dependent claims 8 and 10 have been deleted in view of the amendments made to claim 1.

Independent claim 31 has been amended similar to amended claim 1.

The Prior Art

EP 0745658

The Examiner has referred to formulae 5 and 6 in Table 1 of EP 0745658. Formulae 5 and 6 both include a 1,4-phenylene vinylene repeat unit. However, in neither formula does this repeat unit have two adjacent substituents as required by amended claims 1 and 31. Contrary to the Examiner's suggestion, in fact, none of the repeat units in formula 6 have two adjacent substituents.

Further, in formula 5, only the 1,2-phenylene vinylene repeat unit has two adjacent substituents.

As explained in the second full paragraph of page 3 of the present description, it is the particular substitution pattern claimed in present claims 1 and 31 that produces the advantages of the present invention. This substitution pattern neither is disclosed nor even suggested in EP 0745658. The skilled person is given absolutely no suggestion or incentive in EP 0745658 to provide a poly(1,4-phenylene vinylene) compound comprising a 1,4-phenylene vinylene repeat unit having adjacent substituents as required by the present invention. This is particularly because the skilled person is given no information in EP 0745658 (or indeed in any other of the cited documents) that the orientation of the substituents as claimed in current claims 1 and 31 would affect the photoluminescence or electroluminescence of the compound and certainly, he is given no information that this orientation would give a blue-shift in the photoluminescence or electroluminescence of the compound.

In view of the above, the present invention is not rendered obvious by the disclosure of EP 0745658.

Wei, Antoniadis and Wan

Wei, Antoniadis and Wan all disclose 2,3-diphenyl PPV. In each case this material is made by thermal conversion of a soluble precursor. The products are insoluble. Thus, these materials are completely contrary to the present claimed compound which must be soluble. This has the enormous advantage that the compounds according to the present invention can be processed in their final form

rather than via a precursor polymer which requires thermal conversion. This is not discussed or even mentioned in any one of Wei, Antoniadis and Wan because they are concerned only with insoluble products.

Starting from any one of Wei, Antoniadis or Wan, the skilled person is given no suggestion or incentive to provide a soluble compound according to the present invention nor is he given any information on how this could be achieved. As such, the subject matter of present claims 1 and 31 cannot be rendered obvious to the skilled person by the disclosures of Wei, Antoniadis and Wan.

Hsieh

Hsieh discloses in its Example 6 (see columns 33 and 34) the polymer poly(2,3-diphenyl-p-phenylenevinylene). The polymer is manufactured in a two-step process. The first step forms a chlorine-containing precursor polymer. This can be forged into a thin film which is then thermally converted to the conjugated final product. As such, the final product will be insoluble. As mentioned above in relation to Wei, Antoniadis and Wan, this is completely contrary to the present invention where the compounds are soluble in their final form. The skilled person is not taught this advantage in Hsieh. Further, the skilled person would not have found it obvious to provide a compound according to present claims 1 and 31 starting from the disclosure of Hsieh.

In view of the above, it should be clear that the compounds according to amended claims 1 and 31 not only are different from those disclosed in the cited prior art but also have clear advantages over them.

In view of the foregoing amendments and remarks, Applicants respectfully request the reconsideration and reexamination of this application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, L.L.P.

Dated: February 7, 2002

By: Therese A. Hendricks

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Reg. No. 30,389

Marked-Up Claims

1. A soluble, film-forming conjugated poly(1,4-arylene vinylene) compound comprising [an arylene unit] a 1,4-phenylene vinylene unit having adjacent substituents, said substituents being oriented such as to affect the electronic structure of the compound sufficiently to cause a blue-shift in the photoluminescence and/or electroluminescence of the compound.

14. A method for the production of a compound as defined in claim 1, which method comprises polymerizing a bis(halomethyl) substituted [aryl] phenyl monomer in the presence of a base to form a poly(arylene vinylene), wherein the [aryl] phenyl monomer has adjacent substituents on the [aryl] phenyl residue.

31. An electric, electronic, optical or optoelectronic component or device having a coating of a soluble, film-forming conjugated poly(1,4-arylene vinylene) compound comprising [an arylene] a 1,4-phenylene vinylene unit having adjacent substitutents which produces blue-shifted electroluminescence or photoluminescence.

PENDING CLAIMS

1. A soluble, film-forming conjugated poly(1,4-arylene vinylene) compound comprising a 1,4-phenylene vinylene unit having adjacent substituents, said substituents being oriented such as to affect the electronic structure of the compound sufficiently to cause a blue-shift in the photoluminescence and/or electroluminescence of the compound.

2. A compound according to claim 1, wherein the substituents are independently selected from:

(i) R-, RO-, RS-, and RR'N-

wherein R and R' are independently: a straight or branched chain alkyl group, alkenyl group, or alkynyl group having 1-10 carbon atoms; an aryl group; or an aromatic or non-aromatic heterocyclic group; and

(ii) a group in which the adjacent substituents together form a cyclic group, the cyclic group containing, in addition to the two carbon atoms of the arylene unit to which it is attached, 1-10 carbon atoms and 0 or 1-6 hetero atoms selected from 0, S and N.

3. A compound according to claim 2, wherein the cyclic group contains 2-6 hetero atoms.

4. A compound according to claim 1, wherein one or both of the adjacent substituents are independently selected from a branched alkyl group and a branched alkoxy group.

5. A compound according to claim 1, wherein each of the carbon atoms at the adjacent substituted positions of the aryl unit is attached to its substituent via a hetero atom, selected from O, S or N.

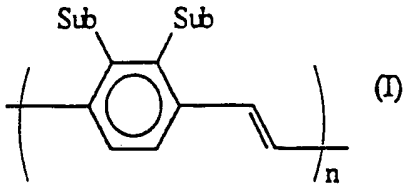
6. A compound according to claim 1, wherein the substituents are solubilising substituents.

7. A compound according to claim 1, wherein one or both of the adjacent substituents are independently selected from butyloxy, ethylhexyloxy and 3',7-dimethyloctyloxy groups.

9. A compound according to claim 1, wherein the poly(arylene vinylene) is a co-polymer comprising a fluorescent unit carrying a distyryl-2,3-substituted-benzene fragment.

11. A compound according to claim 10, wherein the adjacent substituents are in the 2-position and the 3-position of the phenylene residue.

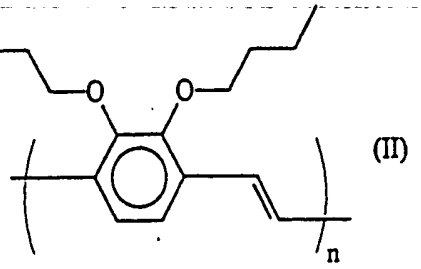
12. A compound according to claim 11, of formula (I):



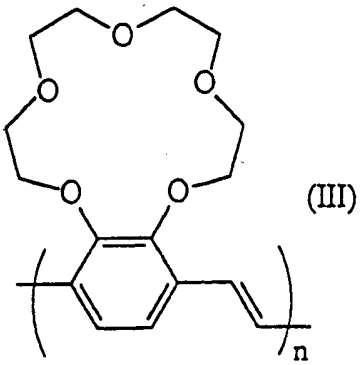
(I)

wherein Sub is a substituent as defined in claim 1, the vinylene unit may be a trans vinylene unit or a cis vinylene unit, and n is the number of units of the formula in the polymer.

13. A compound according to claim 11, of formula (II) or formula (III):



(II)



(III)

wherein the vinylene unit may be a trans vinylene unit or a cis vinylene unit, and n is the number of units of the respective formula in the polymer.

14. A method for the production of a compound as defined in claim 1, which method comprises polymerizing a bis(halomethyl) substituted phenyl monomer in the presence of a base to form a poly(arylene vinylene), wherein the phenyl monomer has adjacent substituents on the phenyl residue.

I5. A method according to claim 14, wherein the monomer is a bis(chloromethyl), bis(bromomethyl) or bis(iodomethyl) monomer.

16. A method according to claim 14, wherein the base is potassium tertiary butoxide.

17. A component or device comprising a compound as defined in claim 1.

19. A component or device according to claim 17, further comprising a photoluminescent or electroluminescent component or device.

20. A light emitting diode comprising a component or device as defined in claim 17.

21. A method for producing a component or device, which method comprises coating a solution of a compound as defined in claim 1 onto a substrate to form a film.

22. A method according to claim 21, wherein the substrate is ITO.

23. A method according to claim 21, wherein the solution is a chloroform solution.

24. A method according to claim 21, wherein the solution is spin-coated onto the substrate.

30. A light-emitting diode having a coating of a compound according to claim 1.

31. An electric, electronic, optical or optoelectronic component or device having a coating of a soluble, film-forming conjugated poly(1,4-arylene vinylene) compound comprising a 1,4-phenylene vinylene unit having adjacent substitutents which produces blue-shifted electroluminescence or photoluminescence.